

ways, and the regulating of parking in seventy-nine additional cities, as well as the responsibility of working with the county road departments, as affected by recent legislation. In order that the local officials of the various counties and cities might have the proper information and the proper understanding of our attitude and the new legislation, we have held meetings in each of our six districts with the respective county officials, who were given an opportunity to express themselves, ask questions, and assist in the preparation of county standards.

The jurisdiction of this law applies after the year 1937 to all road funds for construction and reconstruction recommended by the counties. Reconstruction is the improvement of existing construction. If *reconstruction* costs are over \$1,500 per mile, it will be necessary to submit plans and specifications; if *under* \$1,500 per mile, a summary statement is sufficient. On *new construction*, regardless of cost, plans and specifications must be submitted to the State Highway Commission, and a contract must be let.

In regard to surfacing materials, such as gravel, stone, bituminous products, etc., which are to be used in construction and reconstruction under the supervision of the State Highway Commission, we will require specifications; and if the county buys bituminous materials, cement, etc., tests should be run either by the State Highway Laboratory or some commercial laboratory, in order that the counties may know what they are receiving for their money.

The State Highway Commission does not have any desire to take over all of the 66,824 miles of county highways. We have just recently added some additional mileage to our approximately 9,000 miles in the state highway system in compliance with the acts of the last legislature; but if we were to take over all county roads, we would have a very small amount of money per mile for maintenance and none for construction.

We are having splendid co-operation with the cities and towns in our effort to carry out the acts of the last legislature.

PURDUE'S CONTRIBUTION TO ROAD IMPROVEMENT

A. A. Potter,

Dean of Engineering, Purdue University

No single public improvement has done more, during the past twenty-three years, for the general good of the people of Indiana than have the 60,000 miles of improved highways of our state. Your Purdue University Road School was started 23 years ago through the vision and wisdom of our friend and my colleague, Dr. W. K. Hatt, and carried on during recent years under the able leadership of Prof. Ben H. Petty. It is most gratifying that this Road School, which was started several years before the State Highway Commission was created,

has been helpful throughout this long period to you who directly or indirectly have contributed so richly to highway improvement in Indiana.

I shall confine my brief remarks to a report of the progress of the engineering educational and research activities at your Purdue University.

Last September, Purdue University opened the academic year of 1937-38 with an enrollment in excess of 6,000, of which over 3,500 came to prepare themselves for service to the public as engineers. The engineering enrollment of Purdue University has been increased by more than one thousand during the past two years, because, to a constantly increasing extent, people all over the country realize that Indiana has developed an engineering college at Lafayette that strives to develop the character, personality, and physique of its students, as well as their mentality and technical proficiency, an institution that insists on an engineering program of study that is liberal as well as scientific and practical, and, most important, on engineering teachers who are interested in preparing people for the effective practice of the engineering profession who, at the same time, are good citizens, are creative, and have an interest in social and economic problems as they affect public welfare.

Hendrick Willem van Loon, the realistic popular historian and writer, asked a number of prominent people this simple question: "If you had to live your lives over again, and if you had to go through all the miseries and anxieties that you have gone through, would you do it again?" In other words, "Is life really worth while?"

Most people answered: "No. Once is enough and too much."

Albert Einstein, the great scientist, answered: "Yes. The last few years have been dreadful, but nevertheless, I would not have sacrificed any of it. With all its dreadfulness, life is so terribly interesting, for there is always the unknown."

In my talk before this group four years ago, I reported on the research projects carried on at Purdue University to explore the unknown, and paid for by industry and the railroads. I said that over one and one-quarter million dollars had been contributed by these agencies from 1925 to 1933 for engineering research at Purdue University; this amount does not include the sums expended by industry through the Purdue Research Foundation or the expenditures by the Agricultural Experiment Station. While the depression and recession have greatly influenced the contributions of industry to education and research, several worthwhile projects, which are successfully exploring the unknown, have been supported by industry with practically no interruption. Some of these relate to aeronautics and blind flying; others are concerned with cheaper power through the generation of steam at very high pressures and temperatures; some of the experimentation is in the field

of television, other in metallurgy, other in building materials, and still other in low-cost housing.

For many years, those of us who are interested in the road-building program of Indiana had a dream that your Purdue University might be privileged to add, through basic research, to the effectiveness of this program. Our dream is becoming a reality, as our State Highway Commission, under the authority of an act of the 1937 Indiana State Assembly, is giving us encouragement to conduct research and experimentation in road building, an improvement of permanent benefit to the public. We are particularly indebted for this opportunity to co-operate in research to J. D. Adams, John W. Wheeler, and the late Evan B. Stotsenburg of the former State Highway Commission.

Research, by substituting certainty for uncertainty, is a form of insurance against stagnation.

My colleague, Dr. W. K. Hatt, Director of Highway Research at Purdue University, in co-operation with the State Highway Department, presented before this group Wednesday morning a very encouraging report of progress. He has reported that two groups of problems of interest to you are now being investigated in the Engineering Experiment Station of your Purdue University. One group is concerned with those problems of immediate value to the State Highway Commission and to the counties, and the other with matters which are of a basic character to insure future progress in road construction.

The study of the relation between the amount of bitumen used, the weather conditions, and the degree of ravelling is leading to results which are of immediate value to you; and they are based upon more than 200 samples collected from over 3,000 miles of surface treatments. The effect upon road materials of exposures to climate and to traffic is also in the class of problems of immediate value to those responsible for road construction, as is also the investigation under way of the causes of the stripping of bitumen from aggregate. Other problems of current interest being investigated under the direction of Dr. Hatt are the technique of the testing of bitumens and the relation of the results of such laboratory tests to practical conditions of exposure to traffic and climate. Field as well as laboratory tests are being conducted.

Among the basic studies now under way to clarify present knowledge and to look into the future is an investigation, through field and laboratory tests, of the behavior of clay subgrades under different climatic conditions. This investigation is looking to the improvement of clay subgrades by admixtures intended to stabilize them against variations of moisture. In his report, Dr. Hatt mentions several possible by-products which may be expected from this investigation, such as a suitable, inexpensive material for shoulders or for the con-

struction of bicycle paths. At the meeting of the Advisory Board, of which Mr. Keefe is Chairman, plans were made for an experimental test road to be built next spring. Another basic problem now under way is a study of the testing process itself, with the hope that this will result in some simple inexpensive tests in the interest of laboratory testing economy.

May I take this occasion to thank the present State Highway Commissioners, Messrs. Crawford, Atcheson, and Dicus, and Messrs. Keefe, Bookwalter, and Feldman, the representatives of the Highway Commission on the Advisory Board, for the constructive co-operation and effective encouragement which they have given to Dr. Hatt, to Professor Petty, and to others at Purdue University who are deeply interested in making the co-operative project of major value to our State. I also wish again to express appreciation for the helpfulness we have received in connection with the Annual Road School from the different groups listed in the program. My own contacts with many of you during the past 17½ years lead me to feel that we in Indiana are most fortunate in the type of people who are concerned with road building and maintenance, as well as in those who represent the road materials and equipment interests in this state.

CONTRACT SYSTEM VERSUS DAY-LABOR OPERATIONS ON HIGHWAY WORK

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This subject is as old as the process of highway construction itself. The Romans, most noted of highway builders of ancient times, built some of their highways by use of the contract system and some of them by the day-labor system, according entirely to the inclinations or philosophy of the existing government. Even in those times, the comparative merits of the two systems were the subject of argument and discussion. When the Romans were in a hurry, or when their resources, as fixed by tax income, were limited, they used the contract system; but when things were running "high, wide, and handsome," the income of the empire was ample, war slaves abundant, and the elective system of administration selection was a vogue, the day-labor system was used. Since those days, this subject of the contract system vs. day labor has been argued and discussed innumerable times; and, throughout the ages, as now, the preponderance of sound, substantial, economic argument was all on one side. Yet despite past experience, the subject is more alive and more vital today than at any period in American history.